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ENERGY MARKETS

Understanding Current Gasoline Prices and Potential Future Trends

Statement of Jim Wells, Director
Natural Resources and Environment

May 9, 2005

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Highlights

Highlights of GAO-05-675T, a report to House Committee on Government Reform, Subcommittee on Energy and Resources

Why GAO Did This Study

Gasoline prices have increased dramatically in recent weeks and currently, California has the highest gasoline prices in the nation. Consequently, consumers are expected to spend significantly more on gasoline this year than last. Specifically, EIA recently projected that, because of higher expected gasoline prices, the average American household will spend about $350 more on gasoline in 2005 than they did in 2004. Understandably, the public and the press have focused on these higher gasoline prices and some have questioned why this is happening. Moreover, people are concerned about the future, with some analysts projecting prices of crude oil—the primary raw material from which gasoline is produced—to remain at current high levels or even increase. Other analysts expect prices to fall as new oil supplies are developed and as consumers adjust to the current high prices and adopt more energy-efficient practices.

This testimony, as requested, address factors that help explain today's high gasoline prices in the nation as a whole and specifically in California. In addition, potential trends that may impact future prices of crude oil and gasoline are addressed.

www.gao.gov/cgi-bin/getrpt?GAO-05-675T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Jim Wells at (202) 512-3841 or wellsj@gao.gov.

What GAO Found

Crude oil prices and gasoline prices are linked, because gasoline is derived from the refining of crude oil. As a result, crude oil prices and gasoline prices generally follow a similar, albeit not identical, pattern over time. For example, from January 2004 to the present (April 25, 2005), the price of West Texas Intermediate crude oil rose by almost $20 per barrel, an increase of almost 60 percent, while over the same period, average gasoline prices rose nationally from $1.49 to $2.20 per gallon, an increase of 48 percent. Explanations for this large increase in crude oil and gasoline prices include rapid growth of world demand for crude oil and petroleum products, instability in the Persian Gulf region, and actions by the Organization of Petroleum Exporting Countries (OPEC) to restrict the production of crude oil and thereby increase its price on the world market. In addition to the cost of crude oil, gasoline prices are influenced by a variety of other factors, including refining capacity constraints, low inventories, unexpected refinery or pipeline outages, environmental and other regulations, and mergers and market power in the oil industry.

Gasoline prices in California, and in other West Coast states, have consistently been among the highest in the nation and recent experience is no different. For the last week in April, the price of regular grade gasoline in California was $2.57 per gallon, about 37 cents above the national average. Explanations for California's higher than average gasoline prices include (1) California's unique gasoline blend, which is cleaner burning and more expensive to produce than any of the other commonly used gasoline blends; (2) a tight balance between supply and demand in the West Coast, and the long distance to any viable sources of replacement gasoline in the event of local supply disruptions; and (3) California's higher level of gasoline taxes—California currently taxes a gallon of gasoline at 30 cents per gallon more than the state with the lowest taxes, Alaska. Some sources have also attributed high gasoline prices, in part, to the fact that California's refining sector is more concentrated in the hands of fewer companies than in other refining areas, such as the Gulf Coast.

Future gasoline prices will, in large part, be determined by the supply and demand for crude oil and its price on the world market. World crude oil demand is projected to rise, so new sources will have to be developed or prices will rise. Technological innovations that reduce the cost of finding or extracting crude oil could reduce prices, other things remaining constant. Greater conservation, or improvements in energy efficient technologies could also mitigate rising demand and reduce upward pressure on prices. In addition, alternative fuel sources may become more economical, thereby supplanting some of the demand for crude oil and gasoline in the future.

America faces daunting challenges in meeting future energy demands, and policy makers must choose wisely to ensure that the country can meet these demands, while balancing environmental and quality of life concerns.

Mr. Chairman and Members of the Subcommittee:

I am pleased to participate in the Subcommittee's hearing to discuss today's gasoline prices and the factors behind future trends in those prices. Soaring retail gasoline prices have garnered much media attention and generated much public anxiety, particularly in a state as dependent on gasoline as California. According to data published by the American Automobile Association, since a year ago, average national gasoline prices have increased 23 percent to $2.24, with average prices in California currently at $2.63 per gallon, 25% more than in New Jersey, which has the nation's lowest average prices. In the Los Angeles area, prices have increased 20 percent to $2.60 in the same period. According to the Department of Energy's Energy Information Administration (EIA), which compiles and analyzes energy statistics, higher expected gasoline prices in 2005 will increase the average American household's spending on gasoline by about $350 over 2004 expenditures. Nationally, each additional ten cents per gallon of gasoline adds about $14 billion to America's annual gasoline bill. Still, when adjusted for inflation, gasoline prices are not at an all time high—the highest inflation adjusted prices occurred in 1981 and were equivalent to a price of about $3.00 today. In addition, U.S. consumers pay less for a gallon of gasoline than consumers in many other industrialized nations, in large part because the United States imposes much lower taxes on gasoline than these other countries.

The availability of relatively inexpensive gasoline has helped foster economic growth and permitted a quality of life not widely available across the globe. Large price increases, especially if sustained over a long period, pose long term challenges to consumers. In this regard, some recent analyses suggest that gasoline prices may stay at today's relatively high level or even increase significantly in the future. For example, some analysts have projected that the price of crude oil—the primary raw material in the production of gasoline—while changing from day-to-day, may remain in the vicinity of current levels for some time. One analysts has even projected that oil may reach $105 per barrel in coming years—almost double the current price. In contrast, others suggest that crude oil prices—and therefore, gasoline prices—will fall as oil companies invest in

more crude oil producing capacity and as consumers respond to higher prices by adopting more energy-efficient practices. Regardless of what happens in the future, the impact of gasoline prices is felt in virtually every sector of the U.S. economy and when prices increase sharply, as they have in recent months, consumers feel it immediately and are reminded every time they fill up their tanks or read in the newspapers about high oil company profits.

It is therefore essential to understand the market for gasoline. In this context, you asked us to discuss (1) how gasoline prices are determined nationally, (2) what factors cause California's prices to be consistently among the nation's highest, and (3) some of the important factors that will determine gasoline prices in the long run. You also requested that we provide some graphical depiction of gasoline prices and other relevant data and we include these in appendix 1 of this document.

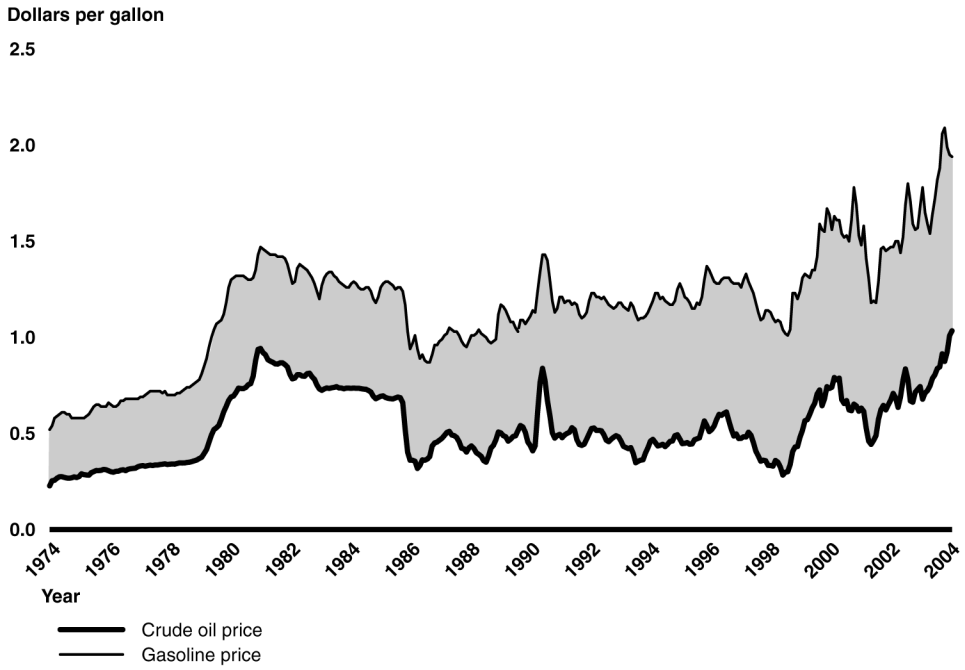
To respond to your questions, we relied heavily on previous work on gasoline prices and other aspects of the petroleum products industry and collected updated data from a number of sources that we deemed reliable. This work was performed in accordance with generally accepted government auditing standards.

In summary, our work has shown:

- Crude oil prices and gasoline prices are inherently linked, because crude oil is the primary raw material from which gasoline and other petroleum products are produced—when crude oil prices fluctuate, gasoline prices generally follow a similar pattern. In recent months, crude oil prices have risen significantly—from January 2004 to the present (April 25, 2005), the price of West Texas Intermediate crude oil, a benchmark for international oil prices, has risen by almost $20 per barrel, an increase of almost 60 percent. Over the same period, average gasoline prices rose nationally from $1.49 to $2.20 per gallon, an increase of 48 percent. Explanations for this large increase in crude oil and gasoline prices include rapid growth of world demand for crude oil and petroleum products, particularly in

China and the rest of Asia, instability in the Persian Gulf region (the source of a large proportion of the world's oil reserves), and actions by the Organization of Petroleum Exporting Countries (OPEC) to restrict the production of crude oil and thereby increase its price on the world market. Figure one illustrates the relationship between crude oil and gasoline prices over the past three decades. The figure shows that major upward and downward movements of crude oil prices are generally mirrored by movements in the same direction by gasoline prices.

Figure 1: Gasoline and Crude Oil Prices—1974-2004 (Not adjusted for inflation)



Source: GAO analysis of Energy Information Administration, Department of Energy, Monthly Energy Review, Monthly Refiner Acquisition Cost of Crude Oil, Composite and and Bureau of Labor Statistics, Monthly Motor Gasoline Prices, U.S. City Averages, Regular Gasoline.

- While crude oil is a fundamental determinant of gasoline prices, a number of other factors also play a role in determining how gasoline prices vary across different locations and over time. For example, refinery capacity in the United States has, in recent years, not expanded at the same pace as demand for gasoline and other petroleum products—during the same period we have imported larger and larger volumes of gasoline from Europe, Canada, and other countries. It is important to

note that imports are not, in and of themselves a problem—frequently imported goods are available at lower prices than domestically produced goods. However, the American Petroleum Institute has recently reported that U.S. refinery capacity utilization has increased to 92 percent. As a result, domestic refineries have little room to expand production in the event of a temporary supply shortfall. Further, the fact that imported gasoline comes from farther away than domestically produced gasoline means that when supply disruptions occur in the United States, it might take longer to get replacement gasoline than if we had excess refining capacity in the United States, and this could cause gasoline prices to rise and stay high until these new supplies can reach the market. In addition, refinery accidents and other localized supply disruptions have at times caused price spikes especially at the state or regional level. Recently, a tragic fire at a BP refinery in Houston killed 15 people and temporarily shut down about 3 percent of the nation's refining capacity—while this event has not been definitively linked to increased prices, such events in the past have, at times, had major effects on prices.

- The volume of inventories of gasoline, maintained by refiners or marketers of gasoline, can also have an impact on prices. As with trends in a number of other industries, the petroleum products industry has seen a general downward trend in the level of gasoline inventories in the United States. Lower levels of inventories may cause prices to be more volatile because when a supply disruption occurs, there are fewer stocks of readily available gasoline to draw from, which puts upward pressure on prices. Regulatory factors also play a role. For example, in order to meet national air quality standards under the Clean Air Act and amendments, many states have adopted the use of special gasoline blends—so-called "Boutique Fuels." Many experts have concluded that the proliferation of these special gasoline blends has caused gasoline prices to rise and/or become more volatile, especially in regions such as California that use unique blends of gasoline, because the fuels have increased the complexity and costs associated

with supplying gasoline to all the different markets. Finally, the structure of the gasoline market can play a role in determining prices. For example, we recently reported that some mergers of oil companies during the 1990s led to reduced competition among gasoline suppliers and may have been responsible for an increase in gasoline prices by as much as 2 cents per gallon.

- Gasoline prices in California, and in other West Coast states, have consistently been among the highest in the nation and recent experience is no different. For example, for the last week in April, when the national average price for regular grade gasoline was $2.20, the California price was $2.57. Explanations for why California's prices have been higher than the national average include (1) California's unique gasoline blend, which is cleaner burning and more expensive to produce than any of the other commonly used gasoline blends; (2) a tight balance between supply and demand in the West Coast, and the long distance to any viable sources of replacement gasoline in the event of local supply disruptions; and (3) California's higher level of gasoline taxes—California currently taxes a gallon of gasoline at 30 cents per gallon more than the state with the lowest taxes, Alaska.

- Future gasoline prices will reflect world supply and demand balance. If demand for oil and petroleum products continues to rise as it has in past years—EIA projects that U.S. demand for crude oil will rise about 38 percent by the year 2025—then oil supply will have to expand significantly to keep up. Currently, world surplus crude oil production capacity—the amount by which oil production can be increased in the short run without installing more drilling equipment or developing new oil fields—is very small. Moreover, many of the world's known and easily accessible crude oil deposits have already been developed and many of these are experiencing declining volumes as the fields become depleted. As a result, new production facilities will have to be built, and perhaps new oil deposits will need to be developed, to meet rising demand for gasoline and other petroleum products. In so doing, entities may encounter higher costs of

extracting and processing oil. For example, there are large stores of crude oil in tar sands and oil shale, or potentially beneath deep water in the ocean, but these sources are more costly to extract and process than many of the sources of oil that we have already tapped. To the extent that extraction and processing costs rise, the price of crude oil and the petroleum products made from it will have to rise to make supplying it economically viable. If, on the other hand, technological innovations improve our ability to extract and process oil, this will increase the available future supply and ease pressure on petroleum product prices.

- Although demand for crude oil is projected to increase, it could fall below current expectations if consumers choose more energy efficient products or otherwise conserve more energy. Such a reduction in demand could lead to lower-than-expected future prices. For example, in response to high gasoline prices in the United States, in the 1980s many consumers chose to switch to smaller or more fuel-efficient vehicles, which reduced demand for gasoline. Environmental issues could also have an impact on world crude oil and petroleum product prices. For example, international efforts to reduce greenhouse emissions could cause reductions in demand for crude oil and petroleum products as more fuel-efficient processes are adopted or as cleaner sources of energy are developed. Additional factors that will likely influence future oil and gasoline prices include geopolitical issues, such as the stability of the Middle East; the valuation of the U.S. dollar in world currency markets; and the pace of development of alternative energy supplies, such as hydrogen fuel cell technology.

Background

In 2004, the United States consumed about 20.5 million barrels per day of crude oil accounting for roughly 25 percent of world oil production. A great deal of the crude oil consumed in this country goes into production of gasoline and, as a nation, we use about 45 percent of all gasoline produced in the world.[1] California alone presently consumes almost 44 million gallons of gasoline per day. To put this in perspective, in 1997 (the last year for which we found available data for international comparisons), only the rest of the United States and Japan consumed more gasoline than California.

Products made from crude oil—petroleum products, including gasoline—have been instrumental in the development of our modern lifestyle. In particular, gasoline, diesel, and jet fuel have provided the nation with affordable fuel for automobiles, trucks, airplanes and other forms of public and goods transportation. Together, these fuels account for over 98 percent of the U.S. transportation sector's fuel consumption. In addition, petroleum products are used as raw materials in manufacturing and industry; for heating homes and businesses; and, in small amounts, for generating electric power. Gasoline use alone constitutes about 44 percent of our consumption of petroleum products in the United States, so when gasoline prices rise, as they have in recent months, the effects are felt throughout the country, increasing the costs of producing and delivering basic retail goods and making it more expensive to commute to work. It is often the case that prices of other petroleum products also increase at the same time and for the same reasons that gasoline prices rise. For example, today's high gasoline prices are mirrored by high jet fuel prices, which have put pressure on airline companies, some of which are currently in the midst of financial difficulties.

[1]The large percentage of total world gasoline production that is consumed by the United States partly reflects the fact that diesel is a commonly used fuel for cars in Europe, while U.S. cars primarily run on gasoline. If all motor vehicle fuels were accounted for, the United States' share of these fuels would be smaller than its share of gasoline. However, we do not have the data to present this more comprehensive measure.

Gasoline prices vary a great deal over time. For example, in the 10-year period April 1995 through April 2005, the national average price for a gallon of regular grade gasoline has been as low as $0.89 and as high as $2.25 without adjusting for inflation. In addition, gasoline prices vary by location and, in recent years, California has consistently had among the highest prices in the nation.

The future path of gasoline prices is difficult to predict, but it is clear that the use of petroleum products worldwide is going to increase for the near term and maybe beyond. Some analysts have predicted much higher crude oil prices—and as a result, higher prices of petroleum products—while others expect prices to moderate as producers respond to high prices by producing more crude oil and consumers respond by conserving more, and investing in more energy-efficient cars and other products. In either case, the price of gasoline will continue to be an important part of the household budgets of Americans for the foreseeable future and therefore, it is important to understand how prices are determined so that consumers can make wise choices.

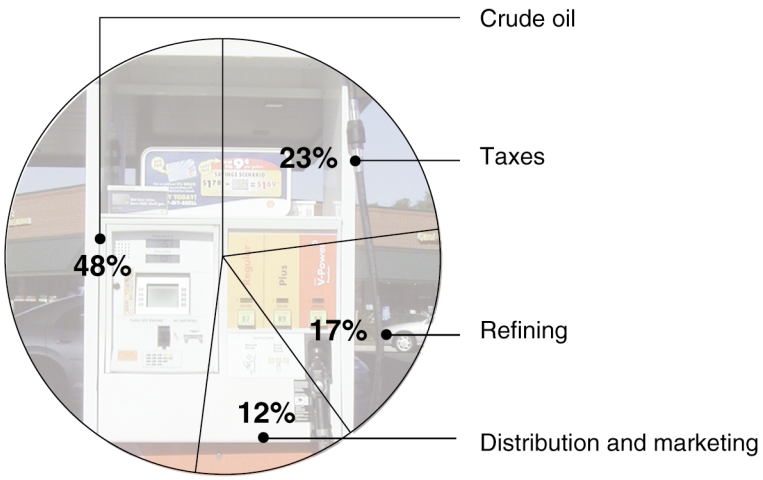
Gasoline Prices Are Determined by the Price of Crude Oil and a Number of Other Factors

Crude oil prices feed directly into the price of gasoline, because crude oil is the primary raw material from which gasoline is produced. For example, according to our analysis of EIA data, crude oil accounted for about 48 percent of the price of a gallon of gasoline on average in 2004 in the United States.[2] When crude oil prices rise, as they have in recent months, refiners find their cost of producing gasoline also rises, and in general, these higher costs are passed on to consumers in the form of higher gasoline prices at the pump. Figure 2 illustrates the importance of crude oil in the price of gasoline. The figure also shows that taxes, refining, and distribution and marketing also play important roles.[3]

[2] EIA also lists taxes; refining costs and profits; and distribution and retail marketing costs and profits as other components of gasoline prices.

[3] The latter two categories, refining, and distribution and marketing, includes costs associated with these activities as well as profits. The figure is a snapshot of how much each component contributes to the price

Figure 2: Elements in the Price of a Gallon of Gasoline (Average for 2004)



Source: GAO analysis based on EIA data.

Because of the prominent role of crude oil as a raw material of gasoline production, in order to understand what determines gasoline prices it is necessary to examine how crude oil prices are set. Overall, the price of crude oil is determined by the balance between world demand and supply. A major cause of rising crude oil prices in recent months has been rapid growth in world demand, without a similar growth in available supplies. In particular, the economy of China has grown rapidly in recent years, leading to increases in their demand for crude oil. In contrast, oil production capacity has grown more slowly, leading to a reduction in the surplus capacity—the amount of crude oil that is left in the ground, but could be extracted on short notice in the event of a supply shortfall. EIA has stated that the world's surplus crude oil production capacity has fallen to about one million barrels per day, or just over one percent of the world's current daily consumption, making the balance between world demand and supply of crude oil very tight. This tight balance between world crude oil demand and supply means that any significant supply disruptions will likely cause prices to rise. For example, a workers' strike in Nigeria's oil sector in October 2004 forced world crude oil prices to record highs

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of a gallon of gasoline, and the relative proportions attributable to each component vary over time as crude oil prices and other factors change.

(Nigeria is the world's seventh largest oil producer, supplying an average 2.5 million barrels per day in 2004).

Another important factor affecting crude oil prices is the behavior of the Organization of Petroleum Exporting Countries (OPEC)--members of which include Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela. OPEC members produce almost 40 percent of the world's crude oil and control almost 70 percent of the world's proven oil reserves. In the recent past and on numerous other occasions, OPEC members have collectively agreed to restrict production of crude oil in order to increase world prices for that commodity.

In addition to the cost of crude oil, gasoline prices are influenced by a variety of other factors, including refining capacity constraints, low inventories, unexpected refinery or pipeline outages, environmental and other regulations, and mergers and market power in the oil industry.

First, domestic refining capacity, has not kept pace with growing demand for gasoline. As demand has grown faster than domestic refining capacity, the United States has imported larger and larger volumes of gasoline and other petroleum products from refiners in Europe, Canada, and other countries. EIA officials told us that, in general, this increase in imports has reflected the availability of gasoline from foreign sources at lower cost than building and operating additional refining capacity in the United States would entail. However, the American Petroleum Institute (API) has recently reported that capacity utilization has been high in the U.S. refinery sector. Capacity has typically averaged over 90 percent, and has recently increased to 93 percent—much higher than the rate in many other industries, which API reports are more typically operating at around 80 percent of capacity. As a result, domestic refineries have little room to expand production in the event of a temporary supply shortfall. Further, the fact that imported gasoline comes from farther away than domestically produced gasoline means that when supply disruptions occur in the United States, it might take longer to get replacement gasoline than if we had excess refining capacity in the United States, and

this could cause gasoline prices to rise and stay high until these new supplies can reach the market.

Gasoline prices may also be affected by unexpected refinery outages or accidents that significantly disrupt the delivery of gasoline supply. For example, in a recent report, we found that unexpected refinery outages had been a factor in a number of prices spikes in California in the 1990s. More recently, the tragic explosion and subsequent fire at a BP refinery in Houston, that killed 15 people, temporarily shut down nearly 4 percent of the nation's refining capacity. While we have not analyzed the potential impact on gasoline prices of this specific event, similar events in the past have caused temporary increases in prices until alternative sources of supply can be brought to market. Pipeline disruptions can have a similar effect, as was seen when Arizona's Kinder Morgan pipeline broke in July 2003 and average gasoline prices jumped 56 cents in a month in Arizona. In addition, tanker spills, and other similar events can all have an impact on gasoline prices at various points in time because they cause interruption in the supply of crude oil or petroleum products, such as gasoline.

The level of gasoline inventories can also play an important role in determining gasoline prices over time because inventories represent the most accessible and available source of supply in the event of a production shortfall or increase in demand. Similar to trends in other industries, the level of inventories of gasoline has been falling for a number of years. In part, this reflects a trend in business to more closely balance production with demand in order to reduce the cost of holding large inventories. However, reduced inventories may contribute to increased price volatility, because when unexpected supply disruptions or increases in demand occur, there are lower stocks of readily available gasoline to draw from. This puts upward pressure on gasoline prices until new supplies can be refined and delivered domestically, or imported from abroad.

Regulatory steps to reduce air pollution have also influenced gasoline markets and consequently have influenced gasoline prices. For example, since the 1990 amendments to the Clean Air Act, the use of various blends of cleaner-burning gasoline—so-called

"boutique fuels—has grown. A number of reports by government agencies, academics, and private entities have concluded that the proliferation of these special gasoline blends has put stress on the gasoline supply infrastructure and may have led to increased price volatility because areas that use special blends cannot as easily find suitable replacement gasoline in the event of a local supply disruption. However, these special gasoline blends provide environmental and health benefits because they reduce emissions of a number of pollutants. GAO is currently working on a report on special gasoline blends that will look at these issues and discuss the effects of these special blends on emissions and on the supply system.

Finally, we recently reported that industry mergers increased market concentration and in some cases caused higher wholesale gasoline prices in the United States from the mid-1990s through 2000.[4] Overall, the report found that the mergers led to price increases averaging about 2 cents per gallon on average. For conventional gasoline, the predominant type used in the country, the change in the wholesale price, due to specific mergers, ranged from a decrease of about 1 cent per gallon—due to efficiency gains associated with the merger—to an increase of about 5 cents per gallon—attributed to increased market power after the merger. For special blends of gasoline, wholesale prices increased by from between 1 and 7 cents per gallon, depending on location.

California's Unique Gasoline and Isolation from Other Markets Contribute to its Higher Gasoline Prices

California, and the West Coast states more generally, have consistently had among the highest gasoline prices in the nation. For example, California's gasoline prices averaged about 21 cents more per gallon than national gasoline prices over the last ten years. In addition, California has at times had more volatile gasoline prices than the rest of the country. For example, in an earlier report on California gasoline prices, we noted that,

[4] *Energy Markets: Effects of Mergers and Market Concentration in the U.S. Petroleum Industry (GAO-04-96, May 2004).*

while gasoline prices did not spike more frequently than in the rest of the United States, California's gasoline price spikes were generally higher.[5]

Many of the factors influencing gasoline prices nationwide have had an even more dramatic effect on California prices. For example, California's high gasoline prices have been attributed, in part, to its cleaner burning gasoline. In response to air quality problems and in order to meet air quality standards resulting from the Clean Air Act and amendments, California adopted a unique blend of gasoline in 1996 that increased refining costs and likely caused prices of gasoline in the state to rise. California's blend of gasoline is unique in the United States and, according to EPA models, is the cleanest burning of all the widely used special gasoline blends in the country. This gasoline blend is also very difficult to make, and those refineries that chose to make it had to install expensive new equipment and refining processes in order to meet the specifications of the gasoline. Some studies have suggested that the current blend of California gasoline costs between 5 and 15 cents more per gallon to make than conventional gasoline. It is likely that these costs are passed on, at least in part, to consumers.

In addition, in recent years, California has developed a tight balance between supply and demand, which has at times led to sharper or longer price spikes when supply disruptions have occurred. Expansion of the gasoline supply infrastructure has not kept pace with growing demand, and as a result, the California refinery system has run at near capacity. For example, according to EIA testimony before the Congress, demand for gasoline in California has grown at roughly two to four times production capacity growth. California Energy Commission staff told us that the tight supply and demand balance has led to large price movements in response to even small supply disruptions, caused by refinery outages and other events.

[5] GAO, *Motor Fuels: California Gasoline Price Behavior,* GAO/RCED-00-121 (Washington, D.C.: April 28, 2000).

Moreover, supply disruptions may have a larger impact on California than on other states. First of all, only a few refineries outside of the state can produce California's special blend of gasoline. In addition, there are no major pipelines connecting the state with other major refining areas. Therefore, if supply is disrupted in California, gasoline must be brought in from the few refineries outside the state that make California's blend of gasoline—often from as far away as the Gulf Coast or beyond. And because of the lack of pipeline access to the state, tankers and other means must be used, and the process is slow. For example, we recently reported that gasoline shipped into California by tanker from such places as the Gulf Coast, the U.S. Virgin Islands, Europe, and Asia, can take between 11 and 40 days and added 3 to 12 cents per gallon to the retail price.

Another factor contributing to the prices Californians pay at the gasoline pump is that residents of California pay comparatively higher gasoline taxes than residents in many other states. For example, at about 57 cents per gallon on average, California's total gasoline tax rate is among the highest, behind only New York and Hawaii, and is 30 percent higher than the national average of 44 cents per gallon, according to a November 2004 survey by the American Petroleum Institute.

In our recent report on oil industry mergers discussed earlier in this testimony, we found that the highest price impact of mergers—about 7 cents per gallon of gasoline—was in California. In addition, the California Attorney General recently reported that California's gasoline industry is more concentrated than that of the rest of the United States, with California's six largest refiners controlling more than 90 percent of refining capacity. The California Attorney General noted further, that these six refiners in California control a majority of the terminal facilities and 85 percent of the retail locations in the state. To the extent that these factors lead to greater market power on the part of refiners or gasoline marketers, prices may be higher as a result. However, we have not analyzed this directly.

Future Oil and Gasoline Prices Will Reflect Supply/Demand Balance, but Technological Change and Conservation Will Also Play a Role

Looking into the future, daunting challenges lie ahead in finding, developing, and providing sufficient quantities of oil to meet projected global demand. For example, according to EIA, world oil demand is expected to grow to nearly 103 million barrels per day in 2025 under low growth assumptions, and may reach as high as 141 million barrels per day in 2025 —increases of between 25 and 71 percent, from the 2003 consumption level of 83 million barrels per day. For the United States alone, EIA estimates that oil consumption will increase by between 1.2 and 1.9 percent annually through 2025 depending on assumptions about economic growth and other factors. Looking further ahead, the rapid pace of economic growth in China and India, two of the world's most populous and fastest growing countries, may lead to a similarly rapid increase in their demand for crude oil and petroleum products. While these countries currently consume only a small fraction of world crude oil, the pace of their demand growth could have far reaching implications if recent trends continue. For example, consumption of oil by China and India is currently far below that of the United States, but is projected to grow at a more rapid rate. EIA's medium-growth projections estimate that oil consumption for China and India will grow by about 4 percent annually through 2025, while consumption in the U.S. is projected to grow at an annual rate of 1.6 percent over the same period.

To meet the rising demand for gasoline and other petroleum products, new oil deposits will likely be developed and new production facilities built. Currently, many of the world's known and easily accessible crude oil deposits have already been developed, and many of these are experiencing declining volumes as fields become depleted. For example, the existing oil fields in California and Alaska have long since reached their peak production, necessitating an increasing volume of imported crude oil to West Coast refineries.[6] Developing new oil deposits may be more costly than in the past, which

[6] Even if new oil fields are developed in the Arctic National Wildlife Refuge, by the time these fields reach their expected peak production of 876,000 barrels per day, according to EIA projections, U.S. demand at this time would have increased by far more than this amount.

could put upward pressure on crude oil prices and the prices of petroleum products derived from it. For example, some large potential new sources, such as oil shales, tar sands, and deep-water oil wells, require different and more costly extraction methods than are typically needed to extract oil from existing fields.[7] In addition, the remaining oil in the ground may be heavier and more difficult to refine, necessitating investment in additional refinery processes to make gasoline and other petroleum products out of this oil. If developing, extracting, and refining new sources of crude oil are more costly than extracting and refining oil from existing fields, crude oil and petroleum product prices will rise to make these activities economically feasible.

On the other hand, technological advances in oil exploration, extraction, and refining could mitigate future price increases. In the past, advances in seismic technology significantly improved the ability of oil exploration companies to map oil deposits, which enabled them to ultimately extract the oil more efficiently, thereby getting more out of a given oil field. In addition, improvements in technology have enabled oil companies to drill in multiple directions from a single platform, and also to pin-point specific oil deposits more accurately, which has led to increases in the supply of crude oil. Further, refining advances over the years have also enabled U.S. refiners to increase the yield of gasoline from a given barrel of oil—while the total volume of petroleum products has remained relatively constant, refiners have been able to get more of the more valuable components, such as gasoline, out of each barrel, thereby increasing the supply of these components. Further technological improvements that lower costs or increase supply of crude oil or refined products would likely lead to lower prices for these commodities.

Similarly, innovations that reduce the costs of alternative sources of energy could also reduce the demand for crude oil and petroleum products, and thereby ease price pressures. For example, hydrogen is the simplest element and most plentiful gas in the universe and its use in fuel cells produces almost no pollution. In addition, hydrogen fuel

[7] We are currently working on a report on global oil reserves that will address the constraints on global supply due to tapped oil reserves and the difficulty in extraction.

cell cars are expected to be roughly three times more fuel-efficient than cars powered by typical internal combustion engines. Currently, enormous technical problems stand in the way of converting America's fleet of automobiles from gasoline to hydrogen, including how to produce, store, and distribute the flammable gas safely and efficiently, and how to build hydrogen cars that people can afford and will want to buy. However, there are federal and state initiatives under way as well as many private efforts to solve these technical problems, and if they can be solved in an economical way in the future, the implications for gasoline use could be profound.

Greater conservation or improved fuel efficiency could also reduce future demand for crude oil and petroleum products, thereby leading to lower prices. The amount of oil and petroleum products we will consume in the future is, ultimately, a matter of choice. Reducing our consumption of gasoline by driving smaller, more fuel-efficient cars—as occurred in the 1980s in response to high gasoline prices—would reduce future demand for gasoline and put downward pressure on prices. For example, the National Academies of Science recently reported that if fuel-efficiency standards for cars and light trucks had been raised by an additional 15 percent in 1990, consumption of gasoline in the year 2015 would be 10 billion gallons lower than it is expected to be under current standards. The Congress established fuel economy standards for passenger cars and light trucks in 1975 with the passage of the Energy Policy and Conservation Act. While these standards have led to increased fuel efficiency for cars and light trucks, in recent years, the switch to light trucks has eroded gains in the overall fuel efficiency of the passenger fleet. Future reductions in demand for gasoline could be achieved if either by fuel efficiency standards for cars and light trucks are increased, or consumers switch to driving smaller or more fuel-efficient cars.

The effect of future environmental regulations and international initiatives on oil and petroleum products prices is uncertain. On one hand, regulations that increase the cost or otherwise limit the building of refining and storage capacity may put pressure on prices in some localities. For example, the California Energy Commission told us the lack of storage capacity for imported crude oil and petroleum products may be a severe

problem in the future, potentially leading to supply disruptions and price volatility. Alternatively, international efforts to reduce the generation of green house gas emissions could cause reductions in the demand for crude oil and petroleum products through the development and use of more fuel-efficient processes and as cleaner, lower-emissions fuels are developed and used.

Moreover, geopolitical factors will likely continue to have an impact on crude oil and petroleum product prices in the future. Because crude oil is a global commodity, the price we pay for it can be affected by any events that affect world demand or supply. For example, Venezuela—which produces around 2.6 million barrels of crude oil per day, and which supplies about 12 percent of total U.S. demand for oil—is currently experiencing considerable social, economic, and political difficulties that have, in the past, impacted oil production. In April 2002, the oil flow from Venezuela was stemmed during 3 consecutive days of general strikes, affecting oil production, refining, and exports. Finally, instability in the Middle East, and particularly the Persian Gulf, has in the past, caused major disruptions in oil supplies, such as occurred toward the end of the first Gulf War, when Kuwaiti oil wells were destroyed by Iraq.

Finally, the value of the U.S. dollar on open currency markets could also affect crude oil prices in the future. For example, because crude oil is typically denominated in U.S. dollars, the payments that oil-producing countries receive for their oil are also denominated in U.S. dollars. As a result, a weak U.S. dollar decreases the value of the oil sold at a given price. Some analysts have recently reported in the popular press that this devaluation can influence long-term prices in two ways. First, oil-producing countries may wish to increase prices for their crude oil in order to maintain their purchasing power in the face of a weakening dollar. Secondly, because the dollars that these countries have accumulated, and that they use, in part, to finance additional oil exploration and extraction, are worth less, the costs these countries pay to purchase technology and equipment from other countries whose currencies have gained relative to

the dollar will increase. These higher costs may deter further expansion of oil production, leading to even higher oil prices.[8]

Conclusions

In closing, clearly none of the options for meeting the nation's energy needs are without tradeoffs. Current U.S. energy supplies remain highly dependent on fossil energy sources that are costly, imported, potentially harmful to the environment, or some combination of these three, while many renewable energy options are currently more costly than traditional options. Striking a balance between efforts to boost supplies from alternative energy sources and policies and technologies focused on improved efficiency of petroleum burning vehicles or on overall energy conservation present challenges as well as opportunities. How we choose to meet the challenges and seize the opportunities will help determine our quality of life and economic prosperity in the future.

What is true for the nation as a whole is even more dramatically so in California. California is one of the most populous and steadily growing states in the nation, and its need for gasoline, as well as other energy sources, will grow. However, California's unique problems with respect to developing the right amount and type of infrastructure necessary to ensure a sufficient supply of gasoline, other petroleum products, or alternative fuels must be resolved or viable alternatives developed if California is to continue to enjoy the prosperity and high quality of life it is known for.

We are currently studying the gasoline prices in particular, and the petroleum industry more generally, including a primer on gasoline prices, a forthcoming report on special gasoline blends, an analysis of the viability of the Strategic Petroleum Reserve, an evaluation of world oil reserves, and an assessment of U.S. contingency plans should oil

[8] Higher oil prices, because they increase the U.S. trade deficit, may also contribute to the further devaluation of the dollar. Hence, analysts have called this process a vicious cycle in which a weak dollar drives up oil prices, which then feeds back into the trade deficit and cause the dollar to weaken further.

imports from a major oil producing country, such as Venezuela, be disrupted. With this body of work, we will continue to provide Congress and the American people the information needed to make informed decisions on energy that will have far-reaching effects on our economy and our way of life.

Mr. Chairman, this completes my prepared statement. I would be happy to respond to any questions you or the other Members of the Subcommittee may have at this time.

GAO Contacts and Staff Acknowledgements

For further information about this testimony, please contact me at (202) 512-3841 (or at wellsj@gao.gov). Godwin Agbara, Nancy Crothers, Randy Jones, Mary Denigan-Macauley, Samantha Gross, Mark Metcalfe, Michelle Munn, Melissa Arzaga Roye, and Frank Rusco made key contributions to this testimony.

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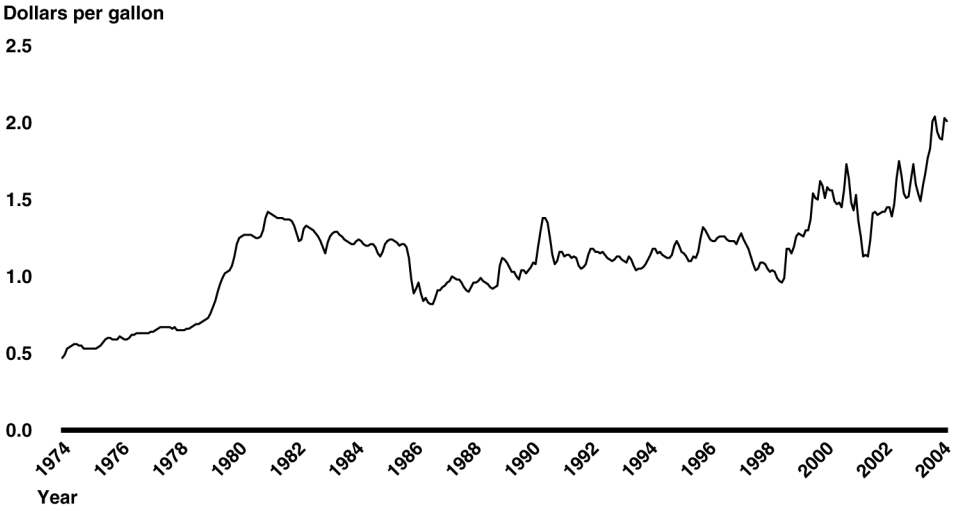
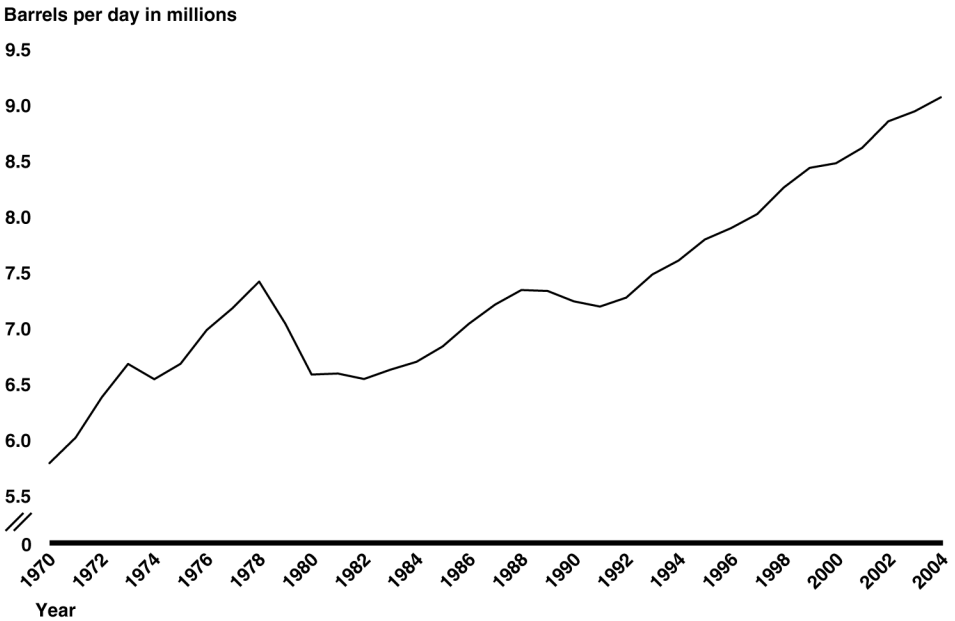
Appendix: Selected Charts and Figures

U.S. Retail Price of Gasoline (Not adjusted for inflation)



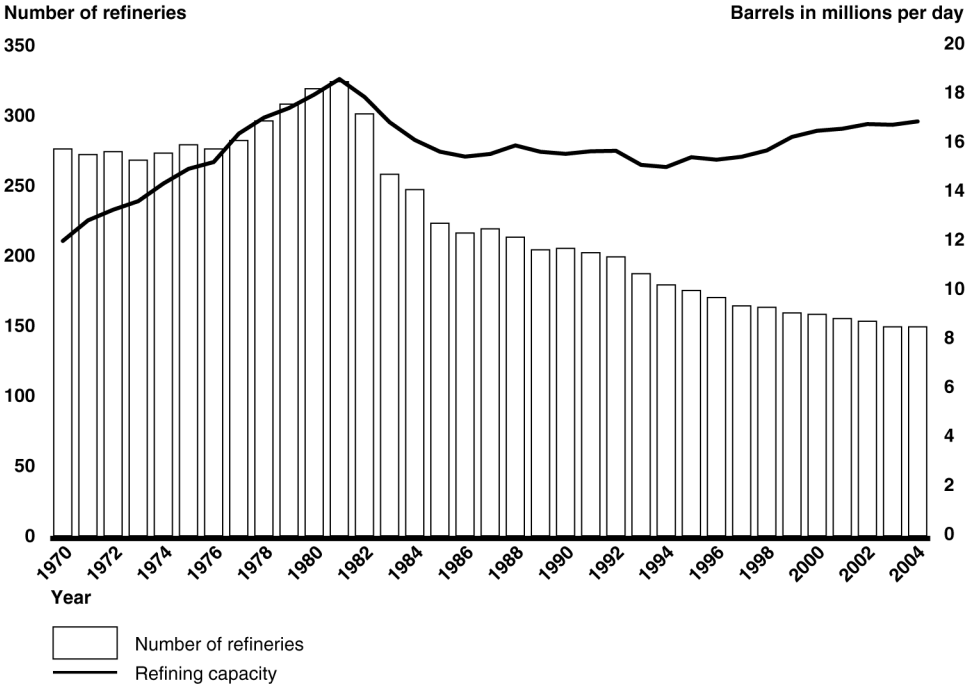
Source: GAO analysis of monthly data from the Bureau of Labor Statistics, U.S. City Averages, Regular Gasoline.

U.S. Gasoline Consumption (1970-2004)



Source: GAO analysis of Annual data from the Energy Information Administration, U.S. Department of Energy.

Refining Capacity and Number of Refineries (1970-2004)



Source: GAO analysis of Annual data from the Energy Information Administration, U.S. Department of Energy.